



Global Language of Business

Quick Reference Guide for 2D Barcodes on GS1 Logistic Label



The GS1 system supports the use of 2D barcodes on logistic labels to enhance data encoding capabilities, specifically GS1 DataMatrix (recommended) and optionally GS1 QR Code. These 2D symbologies are used in addition to the mandatory GS1-128 linear barcode, which encodes the Serial Shipping Container Code (SSCC). 2D barcodes on logistics labels offer enhanced data capacity and efficiency for transport and logistics processes. They complement the mandatory linear barcode and enable a wider range of data to be included directly on the label, improving the overall management of logistic units. The use of GS1 DataMatrix and GS1 QR codes is standardized and supported within the GS1 system.



Global Standard One LLC
Global street 123, 1000 Capitol, Utopia

SSCC: 338300708600000918

CONTENT: 03830070688405

BEST BY (DD.MM.YYYY): 31.07.2023

LOT: A123456

COUNT: 45



(02) 03830070688405 (37) 45

(15) 230731 (10) A123456

(00) 338300708600000918

Example of logistic label with GS1
DataMatrix barcode

Purpose and benefits of 2D Barcodes

- **Enhanced Data Capacity:** 2D barcodes allow for encoding more data than traditional linear barcodes, enabling the inclusion of additional transport-related information directly on the label.
- **Efficient Data Capture:** By using a single scan of a 2D barcode, stakeholders can capture all relevant data elements, reducing the need for multiple scans (time savings, less errors).
- **Support for Diverse Data:** 2D barcodes can hold a variety of data, including the SSCC, ship-to/deliver-to information, routing codes, and Global Identification Number for Consignment (GINC).
- **Immediate Action:** The data in the 2D barcode is intended to be used when there is no access to information from an IT system or when local information requires immediate action.

GS1 Logistic Label Structure

The data on the GS1 Logistics label is divided according to the way they are presented into:

- barcodes
- human-readable data:
 - o text under the barcode in a human-readable form (HRI-Human Readable Information),
 - o text reflecting the data contained in the barcodes and HRIs, with the added headings,
 - o text and graphics in free format.

The GS1 Logistic Label comprises 3 building blocks:

1. **The top building block** may contain anything, e.g., text and graphics. This may include extra information about the logistic unit that is not encoded in the barcode(s).
2. **The middle building block** contains non-HRI text reflecting the information represented in the barcode(s) using data titles rather than AIs and optionally additional information not represented in barcodes (preferably including data titles). **It is recommended to use 2D barcodes in this block.**
3. **The bottom building block** contains the barcode(s) including human readable interpretation (HRI). Only the bottom building block is mandatory with GS-128 barcode containing SSCC.

A GS1 2D symbol, if used, should be placed to the right of the non-HRI text including data titles within the middle building block.



2D Barcode symbologies

- **GS1 DataMatrix:** This is a 2D barcode that encodes GS1 element strings and is identified by the symbology identifier]d2. It is a subset of the ISO/IEC 16022 standard.



(00)138300706800000703

- **GS1 QR Code:** This is another 2D barcode used within the GS1 system, identified by the symbology identifier]Q3. It is a subset of the ISO/IEC 18004 standard.

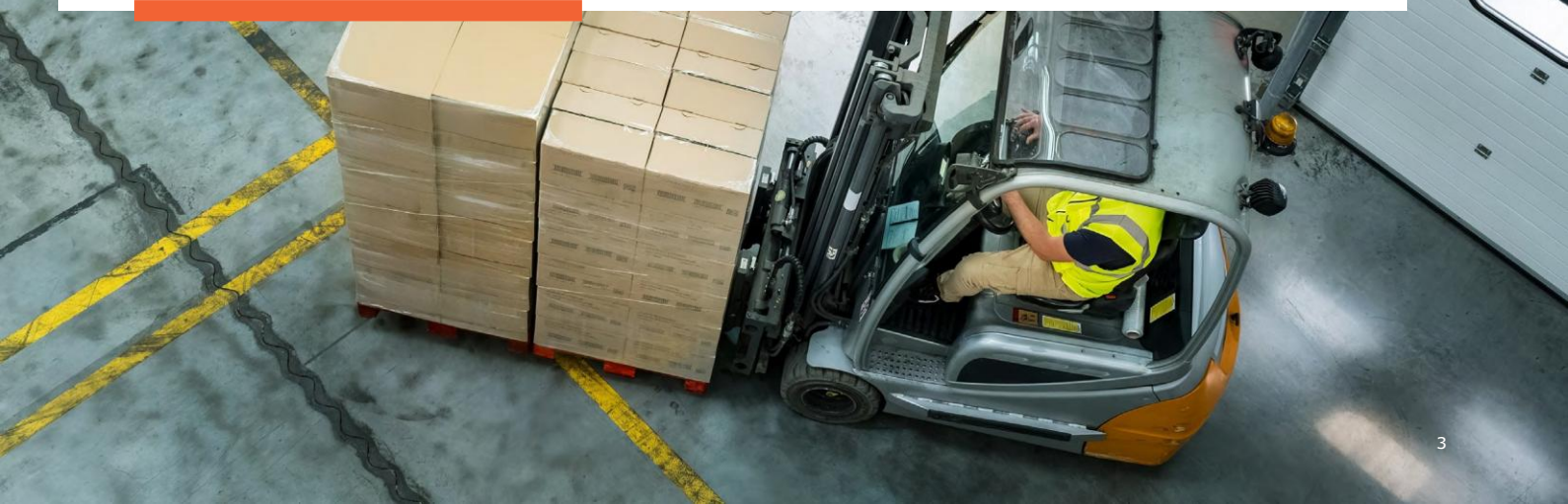


(00)138300706800000703

Both GS1 DataMatrix and GS1 QR Code are reserved for exclusive use by GS1 and support the encoding of GS1 element strings.

Data Encoding

- **Application Identifiers (AIs):** 2D barcodes (just like GS1-128) use GS1 Application Identifiers (AIs) to define the meaning and structure of the encoded data. AIs are numerical prefixes that specify the type of data that follows (e.g., SSCC, GTIN, postal code).
- **GS1 Element String Rules:** Data must be encoded using GS1 element string rules and then encoded in the GS1 2D barcode.
- **Non-Latin Characters:** Non-Latin characters within the data must be encoded using percent-encoding. For example, the character “č” would be encoded as %C4%8D.
- **SSCC:** The Serial Shipping Container Code (SSCC), is mandatory and must be included in both the GS1-128 linear barcode and the 2D barcode.



Barcode Placement

- **Mandatory Linear Barcode:** A GS1-128 barcode containing the SSCC is mandatory on all GS1 logistic labels. This ensures that even stakeholders who cannot scan 2D barcodes can still access essential information.
- If a logistic unit does not have at least one surface area greater than an A6 (105 mm x 148 mm) or 4" x 6" logistic label, a GS1 DataMatrix or GS1 QR Code MAY be used by itself on a logistic label, though a GS1-128 containing a SSCC is still recommended. If a logistic label is used with only a GS1 DataMatrix or GS1 QR Code, care must be taken to ensure trading partners are able to scan this barcode.
- **2D Barcode Placement:** A 2D barcode, if used, SHOULD be placed to the right of the non-HRI text including data titles within the middle building block.
- A GS1 DataMatrix or GS1 QR Code symbol may be included in addition to the GS1-128 symbol.
- **Data Duplication:** When a 2D barcode is included, it SHALL include all element strings that are also encoded in the GS1-128 barcode.
- **Additional Data:** The 2D barcode MAY include additional data elements that are not in the GS1-128 barcode.
- **Label Size:** Adding many data elements to the 2D symbol may increase the size of the barcode, so implementers should consider the trade-off between data and label space.

Data Elements

- **Minimum Data Elements:** The minimum data elements in the 2D barcode may include the SSCC.
- **Additional Data Elements:** Additional data elements may include the ship-to/deliver-to country code, ship-to/deliver-to postal code, Global Identification Number for Consignment (GINC), and routing code.
- Examples of additional AIs that might be included are (4307) for ship-to country code, (420) for ship-to postal code, (401) for GINC, and (403) for routing code.
- Other relevant data elements may be included as needed for specific transport processes.

Human Readable Interpretation

As a back-up key entry and diagnostic aid, a human readable interpretation (HRI) of each barcode element string encoded in a GS1-128 SHALL be provided. For each element string included in a 2D barcode that is not present in a GS1-128 barcode on the label either HRI associated with the 2D barcode(s) or non-HRI text with data titles SHALL be provided.

- HRI alongside a 2D barcode on a logistic label is not required if this is already present with the GS1-128 symbol or is present as data titles and data content elsewhere on the label.
- When a logistic label displays a 2D barcode encoding transport process information that is otherwise represented in text or graphic on the label, HRI of this information is not required.
- On GS1 Logistics Labels HRI characters SHALL be no less than 3 mm (0.1181 in) high.

non-HRI text including data titles

Text with data titles is non-HRI text designed to support manual operations and to facilitate key entry in menu driven systems. It may be used to specify the text equivalent of the data elements represented in barcodes and is comprised of data titles and data content. The data content SHOULD be at least 7 mm in height. If there is no other language agreed between trading partners, data titles must be printed in English. As an option left at the discretion of the labeller, a second language can be added.

Usage and Stakeholder Access

- **Data Access:** The 2D barcode is intended to enable logistics service providers to access necessary information.
- **Stakeholder Compatibility:** Not all stakeholders may be able to scan and use 2D barcodes. The linear barcode ensures that the transport unit can still be handled effectively.
- **Single Scan:** Stakeholders able to process the 2D barcode can capture all relevant data with a single scan.
- **Automated Systems:** The 2D barcode can be used for automated sorting and handling in logistics systems.

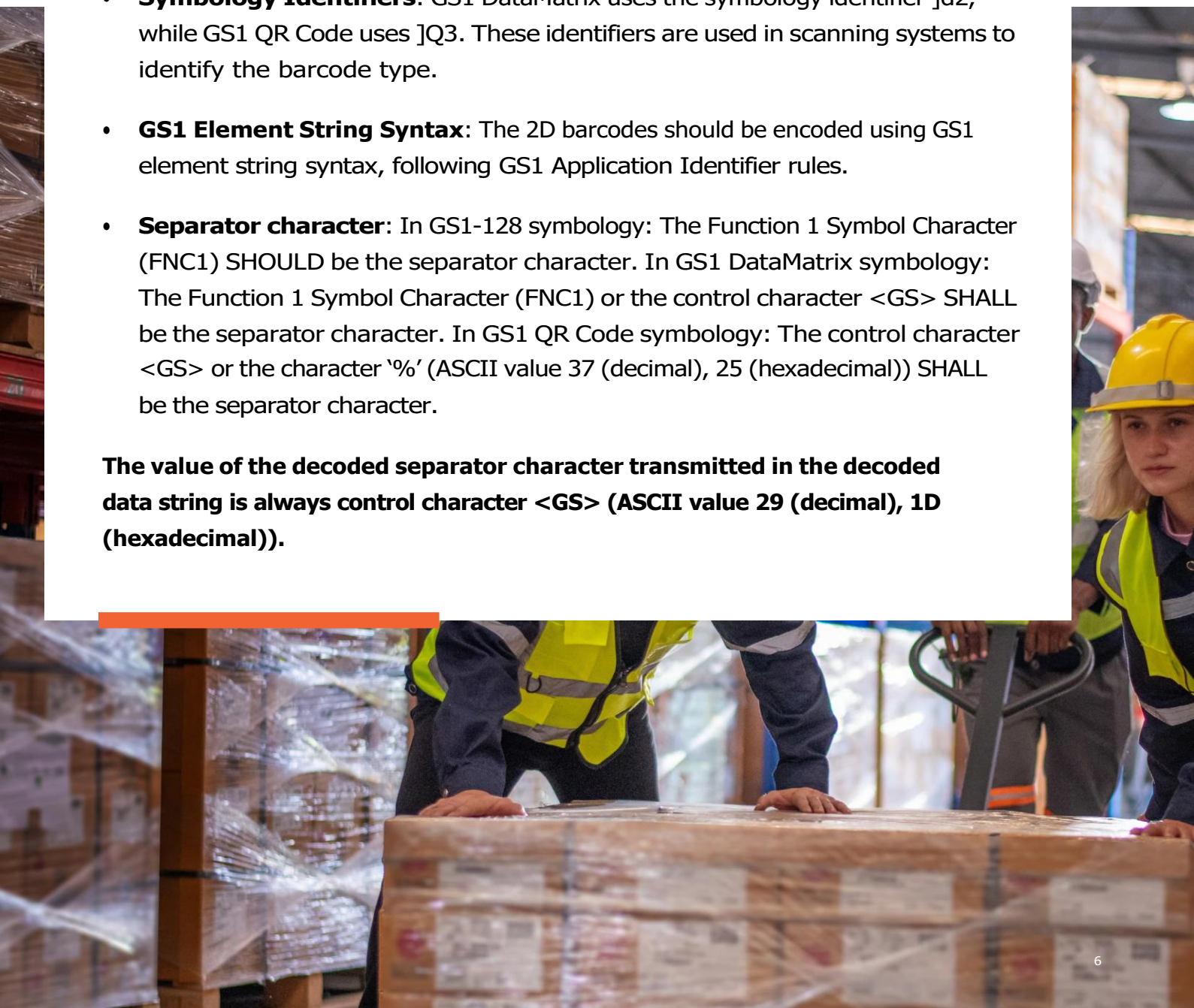
Transition and Implementation

- **Support for Existing Applications:** The 2D barcode is designed to support existing GS1 applications while adding the ability to encode additional data.
- **Consistent Use:** The content and structure of the 2D barcode should be consistent across all stakeholders to ensure interoperability.

Technical Considerations

- **Data Carrier Choice:** The mandatory data carrier for logistic labels is the GS1-128 barcode. A GS1 DataMatrix or GS1 QR Code may be included in addition to the GS1-128 symbol.
- **Label Size:** If a logistic unit does not have sufficient surface area for both a GS1-128 barcode and a 2D barcode, a GS1 DataMatrix or GS1 QR Code may be used by itself. However, the GS1-128 is still recommended.
- **Symbology Identifiers:** GS1 DataMatrix uses the symbology identifier]d2, while GS1 QR Code uses]Q3. These identifiers are used in scanning systems to identify the barcode type.
- **GS1 Element String Syntax:** The 2D barcodes should be encoded using GS1 element string syntax, following GS1 Application Identifier rules.
- **Separator character:** In GS1-128 symbology: The Function 1 Symbol Character (FNC1) SHOULD be the separator character. In GS1 DataMatrix symbology: The Function 1 Symbol Character (FNC1) or the control character <GS> SHALL be the separator character. In GS1 QR Code symbology: The control character <GS> or the character '%' (ASCII value 37 (decimal), 25 (hexadecimal)) SHALL be the separator character.

The value of the decoded separator character transmitted in the decoded data string is always control character <GS> (ASCII value 29 (decimal), 1D (hexadecimal)).



Symbol specification table 5 – logistic units scanned in general distribution

Symbol(s) specified	(*) X-dimension mm (inches)			(**) Minimum symbol height for given X mm (inches)			Quiet Zone		Minimum quality specification
	Minimum	Target	Maximum	For minimum X-dimension	For target	For maximum X-dimension	Left	Right	
GS1-128	0.495 (0.0195")	0.495 (0.0195")	0.940 (0.0370")	31.75 (1.250")	31.75 (1.250")	31.75 (1.250")	10X	10X	1.5/10/660
GS1 DataMatrix (ECC 200)	0.743 (0.0292")	0.743 (0.0292")	1.50 (0.0591")	Height is determined by X-dimension and data encoded			1X on all four sides		1.5/20/660
GS1 QR Code	0.743 (0.0292")	0.743 (0.0292")	1.50 (0.0591")	Height is determined by X-dimension and data encoded			4X on all four sides		1.5/20/660

(*) If the logistic unit is physically too small to accommodate the minimum X-dimension, the minimum X-dimension is 0.250 millimetre (0.0098 inch). For details on barcode production and quality assessment see section 5.12. The minimum symbol height indicate is for bar height only and does not include the human readable interpretation.

(**) If the logistic unit is physically too small to accommodate the minimum, the minimum bar height is the greater of 15 percent of the symbol width including Quiet Zones or 12.70 millimetres (0.500 inch). If the package is physically too small to accommodate this rule, further truncation is permitted, but in no case SHALL the bar height be less than 5.08 millimetres (0.200 inch). For details on barcode production and quality assessment see section 5.12. There is no maximum for the height, but if the maximum X-dimension is used, the symbol height must be equal to or greater than those listed in the Minimum Symbol Height column.

Examples of labels with 2D



Example of consolidated transport & logistic label with GS1 DataMatrix barcode



Example of logistic label with GS1 DataMatrix barcode



Example of logistic label with GS1 DataMatrix barcode

GS1 glossary of terms and definitions

Please refer to the www.gs1.org/glossary for the online version.

Application Identifiers: <https://ref.gs1.org/ai/>

Sources

GS1 General specifications - <https://ref.gs1.org/standards/genspecs/>

GS1 Logistic Label Guideline - <https://www.gs1.org/standards/gs1-logistic-label-guideline/>

For more information, contact your local GS1 Member Organisation:

<https://www.gs1.org/contact/overview/alphabetical>